Importation of leaves and tips of snow peas, *Pisum sativum* var. *macrocarpon* from Bahamas into the United States

Qualitative, Pathway-Initiated Pest Risk Assessment

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A. Introduction

This pest risk assessment was prepared by the Animal and Plant Health Inspection Service (APHIS) of the U.S. Department of Agriculture (USDA) to examine plant pest risks associated with the importation into the United States of **fresh leaves and tips of snow peas (*Pisum sativum* var. *macrocarpon*) grown in Bahamas**. This is a qualitative pest risk assessment, that is, estimates of risk are expressed in qualitative terms such as high or low rather than numerical terms such as probabilities or frequencies. The details of methodology and rating criteria can be found in: ***Pathway-Initiated Pest Risk Assessment: Guidelines for Qualitative Assessments, version 4.0*** (USDA, 1995); available from the individual named in the proposed regulations, or on the web site: www.aphis.usda.gov/ppq/bats/bant.

International plant protection organizations, *e.g.*, North American Plant Protection Organization (NAPPO) and the United Nations Food and Agriculture Organization (FAO), provide guidance for conducting pest risk analyses. The methods used to initiate, conduct, and report this plant pest risk assessment are consistent with guidelines provided by NAPPO and FAO. Our use of biological and phytosanitary terms conforms with the *NAPPO Compendium of Phytosanitary Terms* (Hopper, 1995) and the *Definitions and Abbreviations* (Introduction Section) in *International Standards for Phytosanitary Measures, Section 1—Import Regulations: Guidelines for Pest Risk Analysis* (FAO, 1996).

The *Guidelines for Pest Risk Analysis* provided by FAO (1996) describe three stages in pest risk analysis. This document satisfies the requirements of FAO Stages 1 (initiation) and 2 (risk assessment).

B. Risk Assessment

1. Initiating Event: Proposed Action

This pest risk assessment is commodity-based, and therefore "pathway-initiated"; the assessment is in response to a request for USDA authorization to allow importation of a particular commodity presenting a potential plant pest risk. In this case, the importation of **fresh leaves and tips of snow peas (*Pisum sativum* var. *macrocarpon*) grown in Bahamas** is a potential pathway for introduction of plant pests. Regulatory authority for the importation of fruits and vegetables from foreign sources into the U.S. is found in 7 CFR §319.56 .

2. Assessment of Weediness Potential of Snow Peas, *Pisum sativum* var. *macrocarpon*

The results of the weediness screening (Table 1) did not prompt a pest-initiated risk assessment.

Table 1: Process for Determining Weediness Potential of Commodity

Commodity: *Pisum sativum* L. var. *macrocarpon* Ser. (snow pea) (Fabaceae)

Phase 1: Snow peas are widely cultivated in the United States

Phase 2: Is the species listed in:

NO	*Geographical Atlas of World Weeds* (Holm *et al.*, 1979)
NO	*World's Worst Weeds* (Holm *et al.*, 1977)
NO	*Report of the Technical Committee to Evaluate Noxious Weeds; Exotic Weeds for Federal Noxious Weed Act* (Gunn and Ritchie, 1982)
NO	*Economically Important Foreign Weeds* (Reed, 1977)
NO	Weed Science Society of America list (WSSA, 1989)
NO	Is there any literature reference indicating weediness (*e.g.*, *AGRICOLA*, *CAB*, *Biological Abstracts*, *AGRIS*; search on "species name" combined with "weed").

Phase 3: Conclusion: There are no reports at the species level of weedy tendencies in any of the available literature and the plant is grown throughout the United States, commercially and for home use.

3. Previous Risk Assessments, Current Status, and Pest Interceptions

3a. Decision history for *Pisum sativum* from the West Indies

1924 - Jamaica: Peas (green) permitted entry at Northern Ports.
1924 - Dominican Republic: Peas (green) permitted entry at Northern Ports.
1924 - Cuba*: Peas (green) permitted entry at Northern and Southern Ports.
1925 - Virgin Islands: Peas (green) permitted entry at Northern Ports.
1930 - Barbados: Peas (green) permitted entry at Northern Ports.
1931 - Haiti: Peas (green) permitted entry at Northern and Southern Ports.
1982 - Dominican Republic: Peas permitted entry at All Ports.
1988 - Haiti and Jamaica: Recommendation Number 88-26-56 - to permit snow peas (whole pods) be permitted entry at All Ports subject to inspection.
* - All agricultural products are presently under embargo.

3b. Pest interceptions from 1985-1998 from Bahamas

None

4. Pest List: Pests Associated with *Pisum* spp.

The pest list in Table 2 was developed after a review of the information sources listed in USDA (1995). The list summarizes information on the distribution of each pest, pest-commodity association, and regulatory history.

Table 2: Pest List - *Pisum* spp.

Scientific Name, Classification	Distribution[1]	Comments[2]	References
Pathogens			
Botryotinia (=*Sclerotinia*) *fuckeliana* (de Bary) Whetzel (Discomycetes: Helotiales) Anamorph: *Botrytis cinerea* Pers.:Fr.	Worldwide[3]	c,o	CMI, 1974b; Farr *et al.*, 1989
Erysiphe pisi Syd. (Pyrenomycetes: Erysiphales)	Worldwide[3]	o	CMI, 1967; Kapoor, 1967
Erysiphe polygoni DC. (Pyrenomycetes: Erysiphales)	Worldwide[3]	c,o	Godfrey, 1993; Hagedorn, 1984
Fusarium oxysporum Schlechtend.:Fr. f.sp. *pisi* (J.C. Hall) W. C. Snyder and Hanna (Fungi Imperfecti: Hyphomycetes)	Worldwide[3]	o	Farr *et al.*, 1989; IMI, 1996b
Pythium aphanidermatum (Edson) (Oomycetes: Peronosporales)	Worldwide[3]	c,o	CMI, 1978; Farr *et al.*, 1989
Sclerotinia sclerotiorum (Lib.) de Bary (Discomycetes: Helotiales)	Worldwide[3]	c,o	Godfrey, 1993; Farr *et al.*, 1989
Sclerotium (=*Corticium*) *rolfsii* Sacc. (Agonomycetes)	Worldwide[3]	c,o	CMI,1992; Farr *et al.*, 1989
Thanatephorus cucumeris (A.B. Frank) Donk (Basidiomycetes: Tulasnellales)	Worldwide[3]	c,o	CMI, 1974a; Farr *et al.*, 1989
Uromyces fabae (Grev.) Fuckel (Basidiomycetes: Uredinales)	Worldwide[3]	c,o	CMI, 1965; CMI, 1990; Farr *et al.*, 1989
Bacteria			
Agrobacterium tumefaciens (Smith & Townsend) Conn	Worldwide[3]	c,o	Bradbury, 1986
Erwinia carotovora var. *carotovora* (Jones) Bergey *et al.*	Worldwide[3]	c,o	Bradbury, 1986
Pseudomonas solanacearum (Smith) Smith	Worldwide[3]	c,o	Bradbury, 1986; Godfrey, 1993
Xanthomonas campestris pv. *phaseoli* (Smith) Dye	Worldwide[3]	c,o	Bradbury, 1986
Viruses			
Alfalfa mosaic alfamovirus	Worldwide[3]	o	Brunt *et al.*, 1996
Bean yellow mosaic potyvirus	Worldwide[3]	o	Brunt *et al.*, 1996

Beet western yellows luteovirus	Worldwide[3]	o	Brunt *et al.*, 1996
Clover yellow vein potyvirus	Worldwide[3]	o	Brunt *et al.*, 1996
Cucumber mosaic cucumovirus	Worldwide[3]	o	Brunt *et al.*, 1996
Lettuce mosaic potyvirus	Worldwide[3]	o	Brunt *et al.*, 1996
Pea mosaic potyvirus	Worldwide[3]	o	Brunt *et al.*, 1996
Pea seed-borne mosaic potyvirus	Poss. Worldwide[3]	o	Hagedorn, 1984
Tomato spotted wilt tospovirus	Worldwide[3]	o	Brunt *et al.*, 1996
Arthropods			
Acyrthosiphon pisum (Harris) (Homoptera: Aphididae)	Widespread[3]	c,o,y	Blackman and Eastop, 1984
Aphis gossypii Glover (Homoptera: Aphididae)	BS,US	c,o,y	Blackman and Eastop, 1984, CIE, 1968
Aulacorthum solani (Kaltenbach) (Homoptera: Aphididae)	Widespread[3]	c,o,y	Blackman and Eastop, 1984
Bemesia tabaci (Gennadius) (Homoptera: Aleyrodidae)	BS,US	c,o,y	EPPO, 1997a; IIE, 1986
Chrysodeixis includens (Walker) (Lepidoptera: Noctuidae)	BS,US	m,o	CPPC, 1991; Franca and Giordano, 1984; Zhang, 1994
Etiella zinckenella (Treitschke) (Lepidoptera: Pyralidae)	Worldwide[3]	c,o	CPC, 1997
Ferrisia virgata (Cockerell) (Homoptera: Pseudococcidae)	BS,US	c,o	CPC, 1997
Fundella pellucens Zeller (Lepidoptera: Pyralidae)	BS,US	c,o	Godfrey, 1993; Hodges *et al.*, 1983
Helicoverpa zea Boddie (Lepidoptera: Noctuidae)	BS,US	c,o	EPPO, 1995; Godfrey, 1993; IIE, 1993
Liriomyza sativae Blanchard (Diptera: Agromyzidae)	BS,US	c,o,z	EPPO, 1995; FAO, 1993
Liriomyza trifolii (Burgess) (Diptera: Agromyzidae)	BS,US	c,o,z	Spencer, 1973
Maruca testulalis (Geyer) (Lepidoptera: Pyralidae)	BS[3]	n,z	USDA, 1997
Macrosiphum euphorbiae (Thomas)(Homoptera: Aphididae)	Widespread[3]	c,o,y	Blackman and Eastop, 1984
Myzus persicae (Sulzer) (Homoptera: Aphididae)	BS,US	c,o,y	Blackman and Eastop, 1984; CIE, 1979
Nezara viridula (L.) (Heteroptera: Pentatomidae)	BS,US	c,m,o	CIE, 1970; Franca and Giordano, 1984

Plodia interpunctella Hubner (Lepidoptera: Pyralidae)	BS,US	c,o	Zhang, 1995
Pseudoplusia includens (Walker) (Lepidoptera: Noctuidae)	BS,US	c,o	Godfrey, 1993; Hodges *et al.*, 1983
Spodoptera frugiperda J.E. Smith (Lepidoptera: Noctuidae)	BS,US	c,m,o	Godfrey, 1993; Hodges *et al.*, 1983; Saunders *et al.*,1983
Spoladea recurvalis (Fabricius) (Lepidoptera: Noctuidae)	BS,US	c,o	Hodges *et al.*, 1983; IIE, 1991; Zhang, 1994
Thrips palmi Karny (Thysanoptera: Thripidae)	BS,US(FL,HI)	n,x,z_e	EPPO, 1997b; Godfrey, 1993; USDA, 1997
Thrips tabaci Lindeman (Thysanoptera: Thripidae)	BS,US	c,m,o	CPC, 1997; Shelton and North, 1987
Trichoplusia ni Hubner (Lepidoptera: Pyralidae)	BS,US	c,o	CPC, 1997; Hodges *et al.*, 1983

[1] Distribution legend: BS = Bahamas; US = United States; FL = Florida; HI = Hawaii

[2] Comments:
- c = Listed in USDA's non-reportable dictionary as non-actionable.
- m = The pest occurs within the country of export and has been reported to attack the specified host species in other geographic regions; but has not been reported to attack the specified host species in the country of export.
- n = Listed in the USDA catalogue of intercepted pests as actionable.
- o = Organism does not meet the geographic or regulatory definition of a quarantine pest.
- y = Pest is a vector of plant pathogens.
- z_e = External pest: is known to attack or infect the commodity and it would be reasonable to expect the pest may remain with the commodity during processing and shipping.
- z_i = Internal pest: is known to attack or infect the commodity and it would be reasonable to expect the pest may remain with the commodity during processing and shipping.

[3] No specific reports were found for this organism in Bahamas.

5. List of Quarantine Pests

The list of quarantine pests for commercial shipments of leaves and tips of snow peas from Bahamas is provided in Table 3. Should any of these pests be intercepted on commercial (or any other) shipments of *Pisum sativum* var. *macrocarpon* quarantine action may be taken.

Table 3: Quarantine Pests:

Arthropods	*Maruca testulalis* *Thrips palmi*

6. Quarantine Pests Likely to Follow Pathway

Only those quarantine pests that can reasonably be expected to follow the pathway, *i. e.,* be included in commercial shipments of *Pisum sativum* var. *macrocarpon,* were analyzed in detail (USDA, 1995). Only quarantine pests listed in Table 4 were selected for further analysis and subjected to steps 7-9 below.

Table 4: Quarantine Pest Selected for Further Analysis:

Arthropods	*Thrips palmi*

Other plant pests in this assessment, not chosen for further scrutiny, may be potentially detrimental to the agricultural production systems of the United States; however, there were a variety of reasons for not subjecting them to further analysis. For example, they are associated mainly with plant parts other than the commodity; they may be associated with the commodity (however, it was not considered reasonable to expect these pests to remain with the commodity during processing); they have been intercepted as biological contaminants of these commodities during inspections by Plant Protection and Quarantine Officers but would not be expected to be present with every shipment. In addition, the biological hazard of organisms identified only to the generic level are not assessed due to the lack of adequate biological/taxonomic information. This lack of biological information on any given insect or pathogen should not be equated with low risk. By necessity, pest risk assessments focus on those organisms for which biological information is available. By developing detailed assessments for known pests that inhabit a variety of niches on the parent species, *i.e.* on the surface of or within the bark/wood, on the foliage, etc., effective mitigation measures can be developed to eliminate the known organism and any similar unknown ones that inhabit the same niches.

7. Economic Importance: Consequences of Introduction

The consequences of introduction were considered for each quarantine pest selected for further analysis. For qualitative, pathway-initiated pest risk assessments, these risks are estimated by rating each pest with respect to five risk elements (USDA, 1995). Table 5 shows the risk ratings for these risk elements.

Table 5: Risk Rating: Consequences of Introduction

Pest	Climate/ Host	Host Range	Dispersal	Economic	Environ-mental	Risk Rating
Thrips palmi	high	high	medium	medium	high*	high

**This pest is known to attack members of the plant genera, Amaranthus, Cucurbita, Solanum, and Vigna.* In the United States, *Amaranthus pumilus, Cucurbita okeechobeensis* spp. *okeechobeensis, Solanum drymophilum, S. incompletum, S. sandvicense, and Vigna o-wahuensis* are federally listed endangered species. There are over 200 records of host plants on which *T. palmi* has been recorded. The potential impact on endangered or threatened species may be greater than the 6 species listed above.

8. Likelihood of Introduction

Each pest is rated with respect to introduction potential, *i.e.,* entry and establishment. Two separate components are considered. First, the amount of commodity likely to be imported is estimated. More imports lead to greater risk; therefore, the risk rating for the quantity of commodity is the same for all

quarantine pests considered. Second, five biological features, (risk elements) concerning the pest and its interactions with the commodity are considered. The resulting risk ratings are specific to each pest. The cumulative risk rating for introduction was considered to be an indicator of the likelihood that a particular pest would be introduced (USDA, 1995). Table 6 shows our ratings for these risk elements.

Table 6: Risk Rating: Likelihood of Introduction

Pest	Quantity of commodity imported annually	Likelihood survive postharvest treatment	Likelihood survive shipment	Likelihood not detected at port of entry	Likelihood moved to suitable habitat	Likelihood find suitable host	Risk rating
Thrips palmi	low	high	high	medium	medium	medium	medium

9. Conclusion: Pest Risk Potential and Phytosanitary Measures

The measure of pest risk potential combines the risk ratings for consequences and likelihood of introduction (USDA, 1995). The estimated pest risk potential for each quarantine pest selected for further analysis for the importation of *Pisum sativum* var. *macrocarpon* is provided in Table 7.

Table 7: Pest Risk Potential, Quarantine Pests

Pest	Pest risk potential
Thrips palmi	high

Plant pests with a high Pest Risk Potential may require specific phytosanitary measures. The choice of appropiate sanitary and phytosanitary measures to mitigate risk is undertaken as part of Risk Management and is not addressed, *per se*, in this document.

PPQ has many plant pest interceptions from peas from other areas; however, virtually all external pests listed could be detected by inspection. Some of these same pests occur in the Bahamas in addition to other quarantine pests and have been intercepted as hitchhikers with other commodities. Should any of these pests be intercepted on commercial (or any other) shipments of *Pisum sativum* var. *macrocarpon*, quarantine action may be taken.

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